

CLAIMS

1. A composition comprising a partially dehydrated product made by:
  - (I) reacting (A) a hydrocarbyl substituted succinic acid or anhydride with (B) a polyol, a polyamine, a hydroxyamine, or a mixture of two or more thereof, to form a first intermediate product comprising: an ester, partial ester or a mixture thereof when (B) is a polyol; an amide, imide, salt, amide/salt, partial amide or mixture two or more thereof when (B) is a polyamine; or an ester, partial ester, amide, partial amide, amide/salt, imide, ester/salt, salt or a mixture of two or more thereof when (B) is a hydroxyamine, a mixture of a polyol and a polyamine, a mixture of polyol and a hydroxyamine, a mixture of a polyamine and a hydroxyamine, or a mixture of a polyol, a polyamine and a hydroxyamine; the hydrocarbyl substituent of said acid or anhydride having an average of about 8 to about 200 carbon atoms; and
  - (II) heating said first intermediate product at an effective temperature
- 5 to form a second intermediate product with water of reaction being formed, and separating a portion of said water of reaction from said second intermediate product to form said partially dehydrated product, when (A) is said succinic anhydride the amount of water of reaction that is separated is from about 0.2 to about 0.9 moles of said water of reaction per equivalent of said succinic anhydride, when (A) is said succinic acid the amount of water of reaction that is separated is from about 1.2 to about 1.9 moles of said water of reaction per equivalent of said succinic acid, said partially dehydrated product having a total acid number in the range of about 20 to about 100 mg of KOH/g.
- 10 2. The composition of claim 1 wherein said hydrocarbyl substituent has an average of about 18 to about 30 carbon atoms.
- 15 3. The composition of claim 1 wherein a mixture of at least two hydrocarbyl substituted succinic acids or anhydrides is used, the hydrocarbyl substituent of one of said acids or anhydrides having an average of about 12 to about 24 carbon atoms, and the hydrocarbyl substituent of another of said acids or anhydrides having an average of about 60 to about 200 carbon atoms.
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4. The composition of claim 1 wherein said hydrocarbyl substituted succinic acid or anhydride consists of hydrocarbyl substituent groups and succinic groups and is characterized by the presence within its structure of at least about 1.3 succinic groups for each equivalent weight of the hydrocarbyl substituent.

5. The composition of claim 1 wherein said polyol is a compound represented by the formula



wherein in Formula (I), R is an organic group having a valency of m, R is joined to the OH groups through carbon-to-oxygen bonds, and m is an integer from 2 to about 10.

6. The composition of claim 1 wherein said polyol is a glycol, a polyoxyalkylene glycol, a carbohydrate, or a partially esterified polyhydric alcohol.

15 7. The composition of claim 1 wherein said polyol is ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, dibutylene glycol, tributylene glycol, 1,2-butanediol, 2,3-dimethyl-2,3-butanediol, 2,3-hexanediol, 1,2-cyclohexanediol, pentaerythritol, dipentaerythritol, 1,7-heptanediol, 2,4-heptanediol, 1,2,3-hexanetriol, 1,2,4-hexanetriol, 1,2,5-hexanetriol, 2,3,4-hexanetriol, 1,2,3-butanetriol, 1,2,4-butanetriol, 2,2,6,6-tetrakis-(hydroxymethyl)cyclohexanol, 1,10-decanediol, digitalose, 2-hydroxymethyl-2-methyl-1,3-propanediol-(trimethylolethane), or 2-hydroxymethyl-2-ethyl-1,3-propanediol-(trimethylopropane).

25 8. The composition of claim 1 wherein said polyol is a sugar, a starch, or a mixture thereof.

9. The composition of claim 1 wherein said polyol is erythritol, threitol, adonitol, arabinitol, xylitol, sorbitol, mannitol, erythrose, fucose, ribose, xylulose, arabinose, xylose, glycose, fructose, sorbose, mannose, sorbitan, 30 glucosamine, sucrose, rhamnose, glyceraldehyde or galactose.

10. The composition of claim 1 wherein said polyol is a compound represented by the formula



wherein n is a number in the range of 1 to about 5.

5 11. The composition of claim 1 wherein said polyol is a polyhydric alcohol having at least three hydroxyl groups, some of the hydroxyl groups being esterified with an aliphatic monocarboxylic acid of about 8 to about 30 carbon atoms, at least two of the hydroxyl groups not being esterified.

10 12. The composition of claim 1 wherein said polyol is monooleate of glycerol, monostearate of glycerol, monooleate of sorbitol, distearate of sorbitol, or di-dodecanoate of erythritol.

13. The composition of claim 1 wherein said polyamine is an aliphatic, cycloaliphatic, heterocyclic or aromatic compound.

15 14. The composition of claim 1 wherein said polyamine is a compound represented by the formula



20 wherein n has an average value between 1 and about 10, the Alkylene group has from 1 to about 10 carbon atoms, and each R is independently hydrogen or an aliphatic or hydroxy-substituted aliphatic group of up to about 30 carbon atoms.

25 15. The composition of claim 1 wherein said polyamine is ethylene diamine, triethylene tetramine, tris-(2-aminoethyl)amine, propylene diamine, trimethylene diamine, tripropylene tetramine, tetraethylene pentamine, hexaethylene heptamine, pentaethylenehexamine, or a mixture of two or more thereof.

16. The composition of claim 1 wherein said polyamine is an ethylene polyamine.

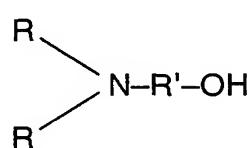
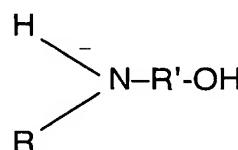
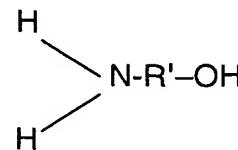
30 17. The composition of claim 1 wherein said polyamine is a heterocyclic amine.

18. The composition of claim 1 wherein said hydroxyamine is (a) an

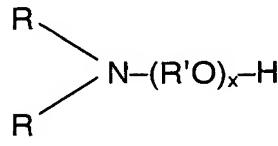
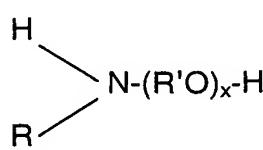
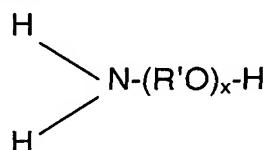
N-(hydroxyl-substituted hydrocarbyl) amine, (b) a hydroxyl-substituted poly(hydrocarbyloxy) analog of (a), or a mixture of (a) and (b).

19. The composition of claim 1 wherein said hydroxyamine is an alkanolamine containing from 1 to about 40 carbon atoms.

5 20. The composition of claim 1 wherein said hydroxyamine is selected from the group consisting of (a) primary, secondary or tertiary alkanol amines represented respectively by the formulae



(b) hydroxyl-substituted poly(hydrocarbyloxy) analogs of said primary, secondary or tertiary alkanolamines represented respectively by the formulae



30 wherein each R independently is a hydrocarbyl group of one to about 8 carbon

atoms or a hydroxyl-substituted hydrocarbyl group of 2 to about 8 carbon atoms, each R' independently is a divalent hydrocarbon group of 2 to about 18 carbon atoms, and each x independently is 2 to about 15, and

(c) mixtures of two or more of any of the above.

5 21. The composition of claim 1 wherein (B) is glycerol, diethanolamine, triethanol amine, or a mixture of two or more thereof.

22. The composition of claim 1 wherein the ratio of equivalents of component (A) to component (B) is about 3:1 to about 1:2.

23. A composition comprising a partially dehydrated product made by:

10 (I) reacting (A) a hydrocarbyl substituted succinic acid or anhydride with (B) a polyamine, a hydroxyamine, a mixture of a polyol and a polyamine, a mixture of a polyol and a hydroxyamine, a mixture of a polyamine and a hydroxyamine, or a mixture of a polyol, a polyamine and a hydroxyamine, to form a first intermediate product comprising: an amide, imide, salt, amide/salt, partial amide or mixture two or more thereof when (B) is a polyamine; or an ester, partial ester, amide, partial amide, amide/salt, amide, ester/salt, salt or a mixture of two or more thereof when (B) is a hydroxyamine, a mixture of a polyol and a polyamine, a mixture of a polyol and a hydroxyamine, a mixture of a polyamine and a hydroxyamine, or a mixture of a polyol, a polyamine and a hydroxyamine; the hydrocarbyl substituent of said acid or anhydride having an average of about 8 to about 200 carbon atoms; and

15 (II) heating said first intermediate product at an effective temperature to form a second intermediate product with water of reaction being formed, and separating a portion of said water of reaction from said second intermediate product to form said partially dehydrated product, when (A) is said succinic anhydride the amount of water of reaction that is separated is from about 0.2 to about 0.9 moles of said water of reaction per equivalent of said succinic anhydride, when (A) is said succinic acid the amount of water of reaction that is separated is from about 1.2 to about 1.9 moles of said water of reaction per equivalent of said succinic acid, said partially dehydrated product having a total acid number in the range of about 20 to about 100 mg of KOH/g.

24. A process, comprising:

(I) reacting (A) a hydrocarbyl substituted succinic acid or anhydride with (B) a polyol, a polyamine, a hydroxyamine, or a mixture of two or more thereof, to form a first intermediate product comprising: an ester, partial ester or mixture thereof when (B) is a polyol; an amide, imide, salt, amide/salt, partial amide or mixture of two or more thereof when (B) is a polyamine; or an ester, partial ester, amide, partial amide, amide/salt, imide, ester/salt, salt or a mixture of two or more thereof when (B) is a hydroxyamine, a mixture of a polyol and a polyamine, a mixture of a polyol and a hydroxyamine, a mixture of a polyamine and a hydroxyamine, or a mixture of a polyol, a polyamine and a hydroxyamine; the hydrocarbyl substituent of said acid or anhydride having an average of about 8 to about 200 carbon atoms; and

(II) heating said first intermediate product at an effective temperature to form a second intermediate product with water of reaction being formed, and separating a portion of said water of reaction from said second intermediate product, when (A) is said succinic anhydride the amount of water of reaction that is separated is from about 0.2 to about 0.9 moles of said water of reaction per equivalent of said succinic anhydride, when (A) is said succinic acid the amount of water of reaction that is separated is from about 1.2 to about 1.9 moles of said water of reaction per equivalent of said succinic acid, said partially dehydrated product having a total acid number in the range of about 20 to about 100 mg of KOH/g.

25. A concentrate comprising about 10% to about 90% by weight of a normally liquid organic diluent, and the composition of claim 1.

26. An emulsion, comprising: an organic phase; an aqueous phase; and an emulsifying amount of the composition of claim 1.

27. An emulsion, comprising: a continuous organic phase, a discontinuous aqueous phase, and an emulsifying amount of the composition of claim 1.

28. A high internal phase emulsion, comprising: a continuous organic phase, a discontinuous aqueous phase, and an emulsifying amount of the composition of claim 1, the weight ratio of said aqueous phase to said organic phase being at least about 4:1.

5 29. An explosive emulsion, comprising: a discontinuous oxidizer phase comprising water and an oxygen-supplying component; a continuous organic phase comprising a carbonaceous fuel; and an emulsifying amount of the composition of claim 1.

10 30. An emulsion fertilizer, comprising: a discontinuous aqueous fertilizer phase comprising at least one water soluble fertilizer component; a continuous organic phase comprising at least one oil; and an emulsifying amount of the composition of claim 1.

15 31. A water-blended fuel composition, comprising: a discontinuous aqueous phase; a continuous fuel phase comprising a normally liquid hydrocarbon fuel; and an emulsifying amount of the composition of claim 1.

32. A lubricant or functional fluid, comprising: an oil phase, an aqueous phase, an emulsifying amount of the composition of claim 1, and at least one functional additive.

20 33. An acidizing fluid, comprising: a continuous oil phase, a discontinuous aqueous phase, an emulsifying amount of the composition of claim 1, and a non-oxidizing acid.